

NAGAHAMA et al
Serial No. 09/500,288
June 13, 2003

REMARKS

Reconsideration of this application and entry of this amendment are requested.
Claims 17-22 remain in the application subsequent to entry of this amendment.
It is proposed to amend claim 17 in order to more particularly point out and distinctly claim that which applicants regard as their invention and to advance prosecution of this application. More specifically, claim 17 is amended and directed to the embodiment where the auxiliary substrate is not removed from the GaN substrate, i.e., the embodiment where the GaN substrate includes a sapphire substrate and a laterally grown single-crystal GaN layer. See the specification, page 5, lines 8 to 13. Eliminating the step of removing an auxiliary substrate such as sapphire shortens the manufacturing time. See page 7, lines 12 to 18.

In comparison with the case of removing the sapphire substrate from the GaN substrate, leaving it in the GaN substrate has advantages that: breakage and chipping of the wafer is prevented; and manufacturing time is shortened (see page 7, lines 12 to 16). On the other hand, if the sapphire substrate remains in the GaN substrate, the warp of the wafer becomes larger than in the case of removing the sapphire substrate (page 21, lines 10 to 13). This means that the strain between the GaN substrate and the semiconductor layers becomes larger and the small cracks are more likely to occur. However, this is compensated by forming the small crack-preventing layer on the GaN substrate, so the small cracks are as effectively prevented as in the case of removing the sapphire substrate (page 21, lines 10 to 13). Thus, while enjoying the advantages of leaving the sapphire substrate in place, the disadvantage of increasing the tendency for the small-cracks is prevented by forming the small-crack-preventing layer.

In the Official Action the sole issue raised is the rejection of claim 17 (only) over U.S. 6,177,292 to Hong et al in view of Koide (JP 11-145516) and Kern U.S. 6,194,743. While only claim 17 is specifically rejected, the remaining claims are discussed on page 4

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of the Official Action, so it is counsel's understanding that claims 17-22 are rejected based upon this combination of references.

The rejection is respectfully traversed having regard to the claim amendments presented above.

The examiner argues that the previous claims were suggested by Hong in view of Koide and Kern. Especially, the examiner has relied on the combination of Hong's device and Koide's ELOG substrate.

However, the amended claims are directed to the device in which the sapphire substrate has not been removed. Combining Hong's device and Koide's ELOG substrate without removing the sapphire substrate is diametrically opposed to the object of Hong's invention. The object of Hong's invention is to solve the problems caused by the sapphire substrate. The problems are, for example, the significant lattice mismatch, the difference of cleavage direction, and the difficulty of forming the electrodes on the back side of the sapphire substrate, which is an insulator (Hong et al, column 1, lines 19 to 42).

Hong teaches solving these problems by completely removing the sapphire substrate from the GaN substrate (Hong et al, column 2, lines 47 to 63). Therefore, combining Hong's device with Koide's ELOG substrate without removing the sapphire substrate is absolutely against the teaching of Hong, which means that the amended claim 17 cannot be rendered obvious by the combination of Hong and Koide. Stated another way, amended claim 17 could not result from a combination of Hong and Koide.

Regarding Kern, Kern merely discloses that AlGaN has a smaller coefficient of thermal expansion than GaN. Kern does not teach or suggest forming an $\text{Al}_a\text{Ga}_{1-a}\text{N}$ ($0 < a < 0.1$) layer on a laterally grown single-crystal GaN layer supported by a sapphire substrate.

Accordingly, amended claims 17 to 25 are suggested by Hong in view of Koide and Kern.

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For the above reasons it is respectfully submitted that the claims of this application define inventive subject matter. Reconsideration, entry of this amendment and allowance are solicited.

Respectfully submitted,

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